Summary of RTCH4 Conditioning

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Status

As of 12/08/08, RTCH4 was fully conditioned to operate at 17 kW with a 3.5 ms pulse length at 2 Hz. This 17 kW is somewhat larger (by 1.7dB) than 120% of the nominal 9.58 kW (power to be dissipated in the cavity). The cavity was operated at this level for 8 hours. During this time, the vacuum pressure (with ion pump only) was about 1.2E-07 torr as measured by the ion gauge, and 8E-08 torr as measured by the ion pump power supply. The cavity was able to run for this time without tripping.

Baking

CH4 was baked two times to 150C. The first bake was from 10/27/08 to 11/3/08. The second bake was from 11/22/08 to 11/26/08. The reason for the second bake was a suspected vacuum problem (see next section).

Vacuum

- Initially, it was suspected that there was a vacuum problem with this cavity (contamination). This was due to the fact that during the first bake, the pressure rose to a much higher level than that in CH3 during the bake. In hindsight, it seems likely that there was a leak in the test stand setup (though leak checking was done and no leak was found). The evidence supporting this is:
  1) On the test stand, the cavity pressure plateaued around 5E-08. The cavity was on the test stand for two months.
  2) On 1/26, CH4 was moved to the storage room and connected to CH3 with a shared ion pump. The pressure in the two came down to approximately 9E-09 torr within a week. Before the move, the pressure in CH3 with the same ion pump was approximately 7E-09 torr. The pressure in CH4 on the test stand had been 5E-08 torr and had not decreased measurably over the previous few weeks.

Settings

- During conditioning, the cavity water temperature feedback loop was not active.
- During conditioning with 17kW, 3.5ms, 2Hz, the cavity resonance frequency *f* was 324.963 kHz (within a few kHz). This was based on varying the drive frequency to minimize reflected power. The tuner position was set to -5451, where a tuner position of 7746/-7640 corresponds to the tuner plunger being all the way into/out of the cavity. At low power, with this tuner setting of -5451, *f* was 325.010 kHz.

Details

- *12/03/08:* Started at low power, 50us pulse width, 1 Hz and conditioned CH4 to ~15 kW, 3 ms, 2 Hz. Multipacting was observed during various stages of the conditioning, but less occurred as time went on.
- *12/04/08:* Continued to condition with a 3.5 ms pulse width at 1 Hz*, 17 kW. Still observed a small amount of multipacting, which was decreasing. On this morning, the turbo pump was valved out . After this only the ion pump was used.

*On the previous day it was possible to run at 2 Hz, but on this day the modulator would not turn on at 2 Hz (tripped immediately).

- *12/08/08*: RT4 was conditioned for approximately 8 hours, at 2 Hz, 17 kW, and 3.5 (or 3.0) ms pulse width.
- Further details may be found at http://www-hins-crl.fnal.gov/hins/Index.jsp

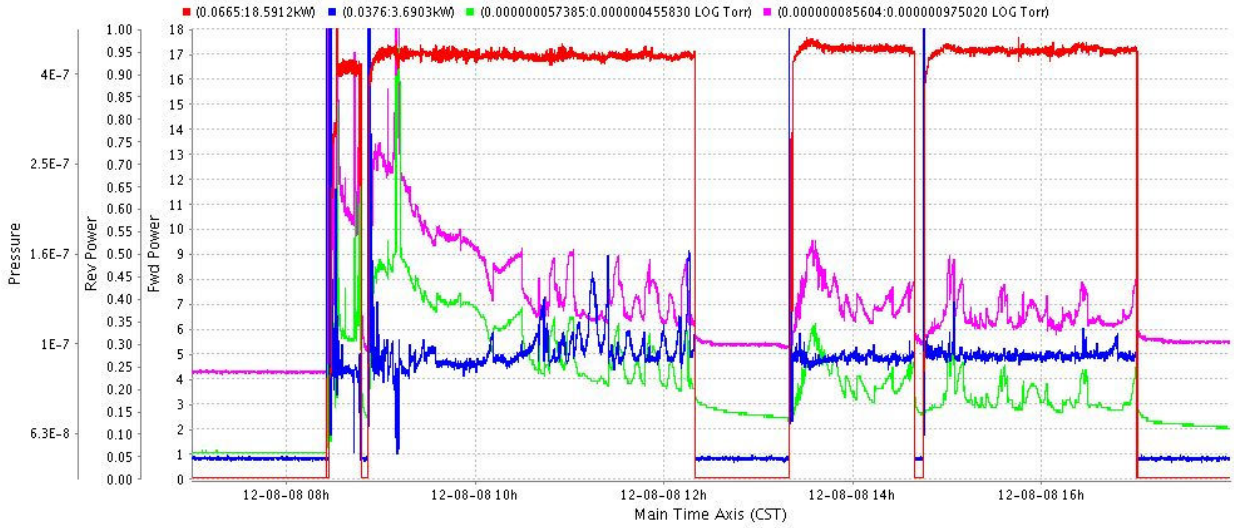

Figure 1: Forward and reverse power (red and blue), and pressure (green = ion pump, magenta = ion gauge) during the final 8 hours of conditioning.